Figure 2-40. M2/M3 Turret Diagnostic Test Panel.
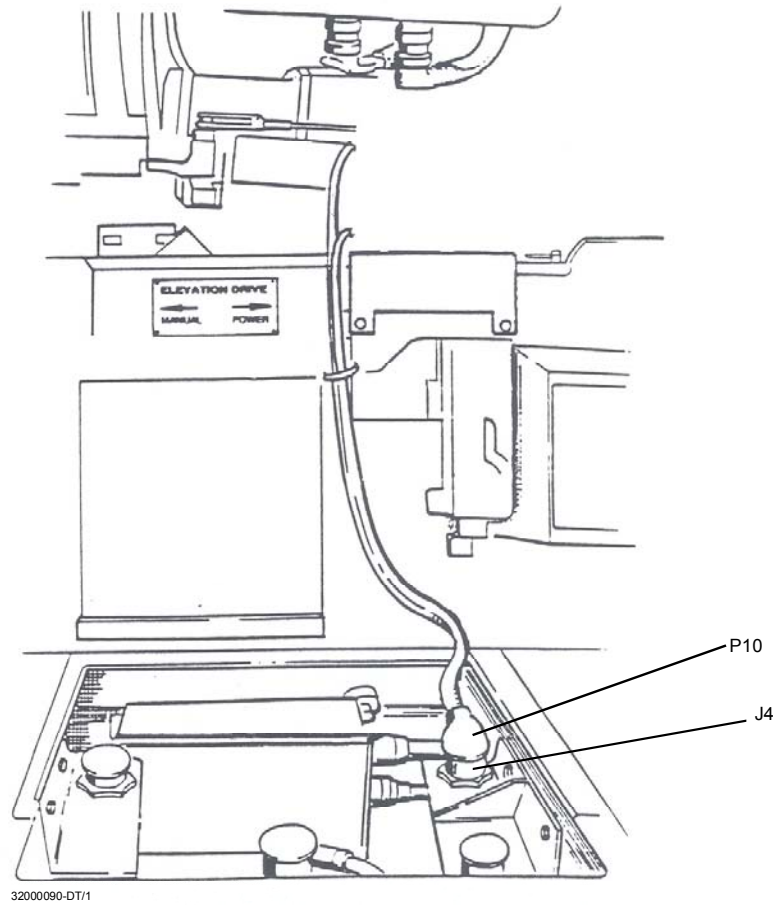
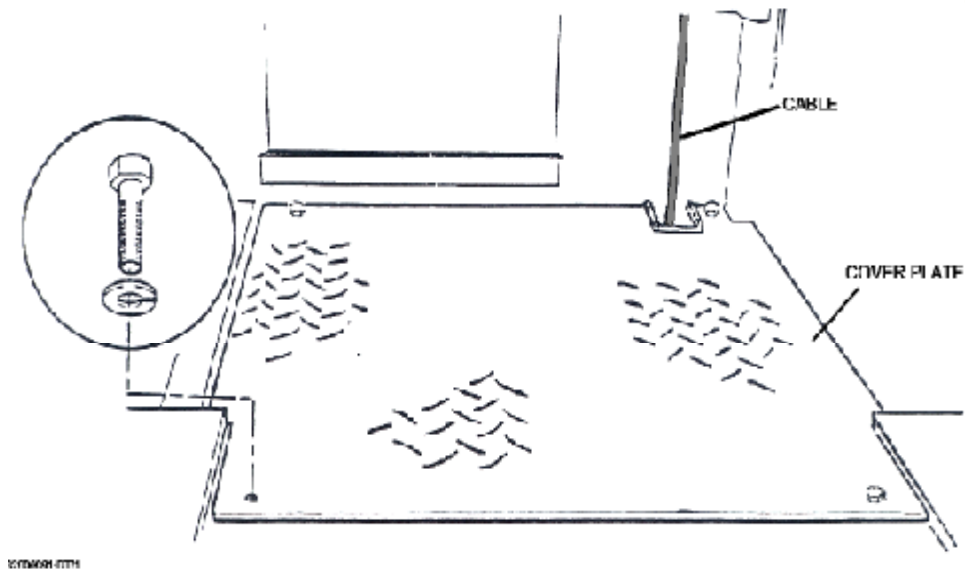**Figure 2-41. M2/M3 P10 to J4 Connection.**

Figure 2-42. M2/M3 MILES 2000 Cover Plate Secured.
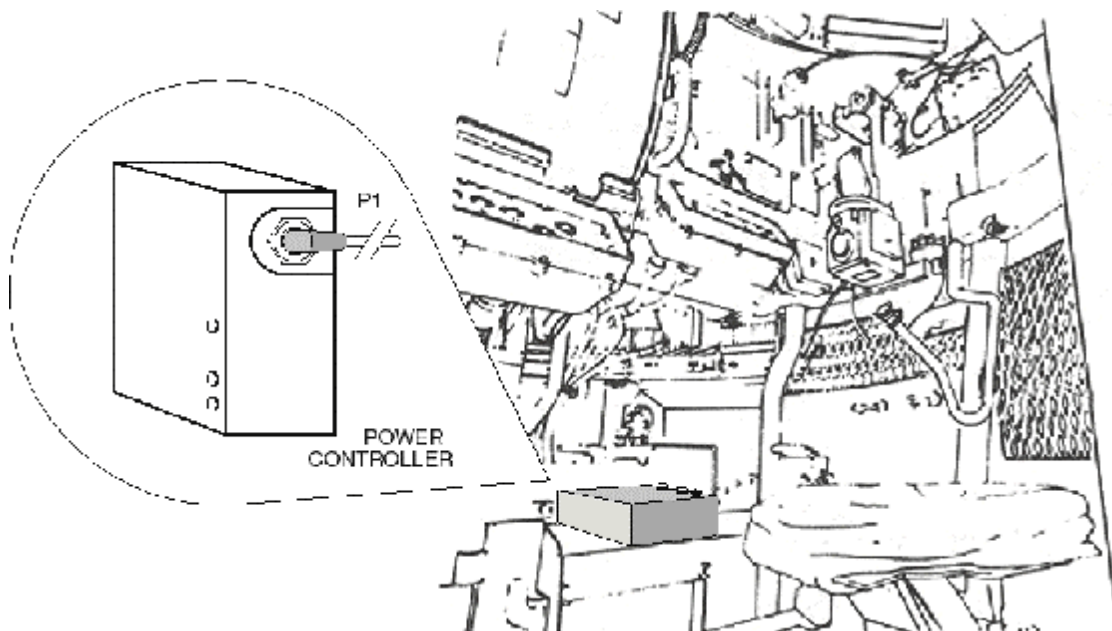
Figure 2-43. M2/M3 Power Controller Location.
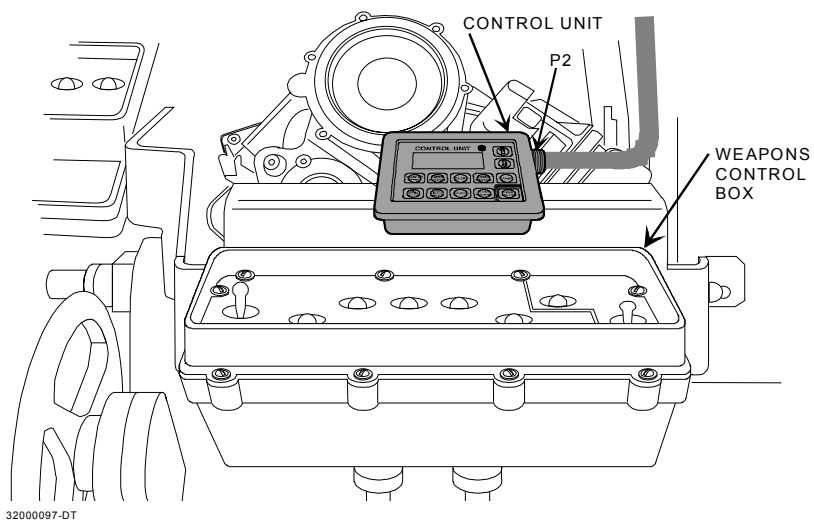
Figure 2-44. M2/M3 Control Unit Connection

TURRET DIAGNOSTIC
TEST PANEL
P10

MCS
RADIO B
J2

MCS
RADIO A
J1

KSI
P3

MCS
RADIO B
P7

MCS
RADIO A
P6

DETECTOR
BELT
LEFT, REAR
P5

DETECTOR
BELT
RIGHT, FRONT
P4

CONTROL
UNIT
P2

MCS
POWER
CONNECTOR
P11

MCS
POWER
CONNECTOR
J3

COAX MIC
P9

ULT
P8

POWER
CONTROLLER
P1
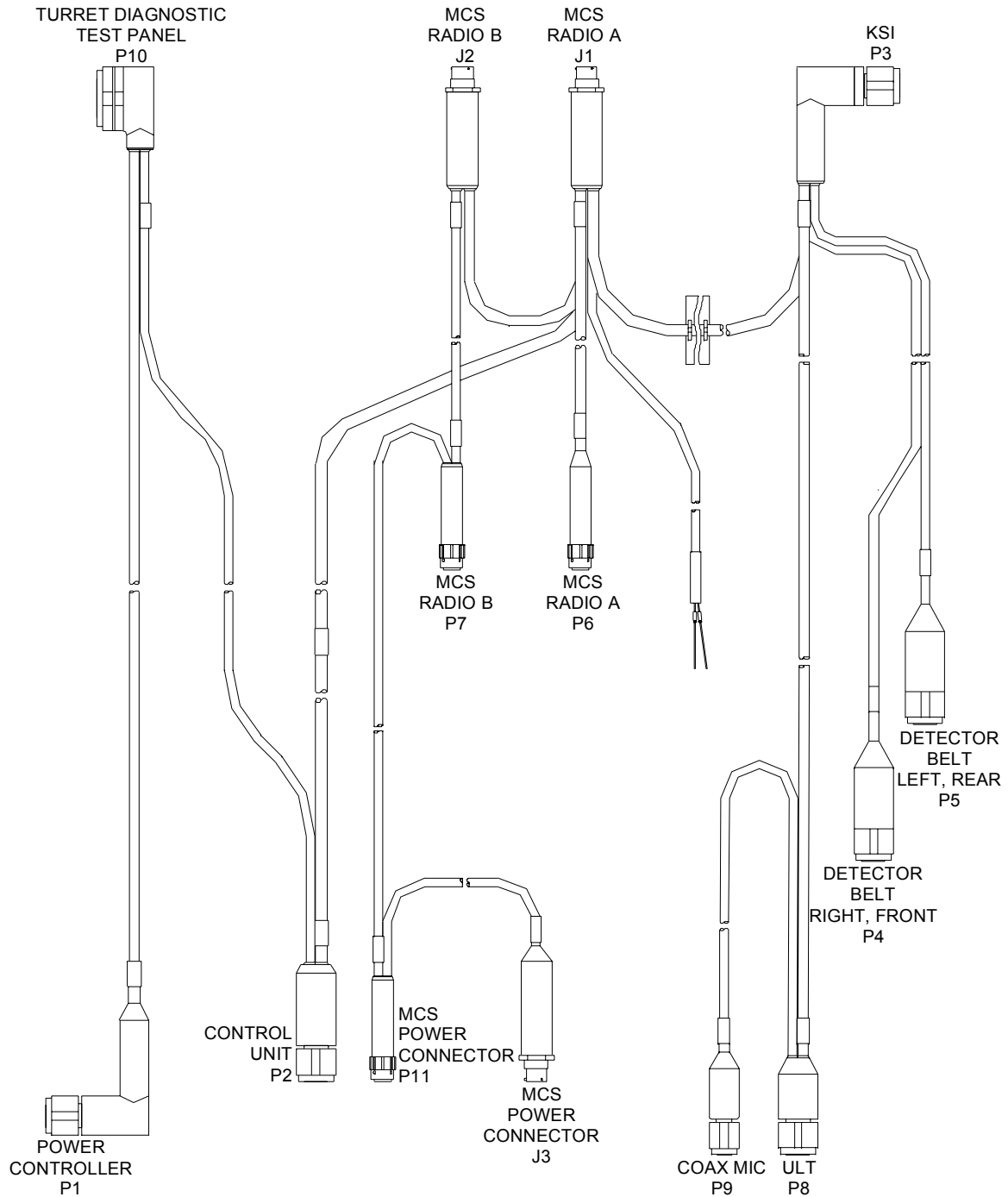
32000101-DT
146507C

Figure 2-45. M2/M3 VIS System Cable.
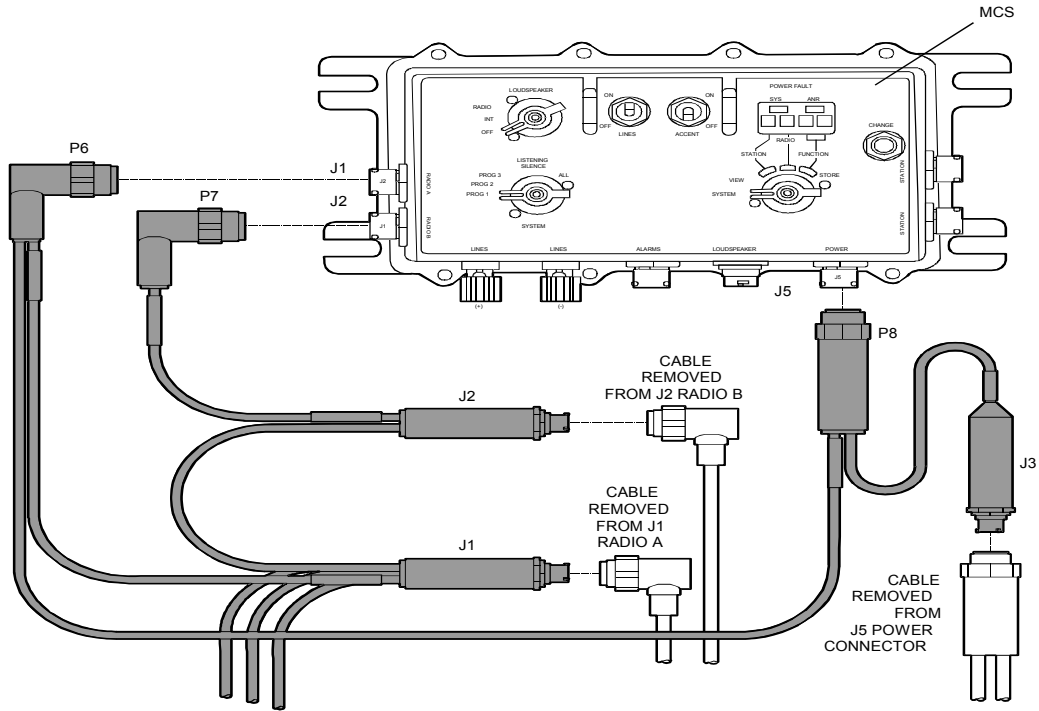
Figure 2-46. M2/M3 Combined VIS System Cable Connection to MCS.

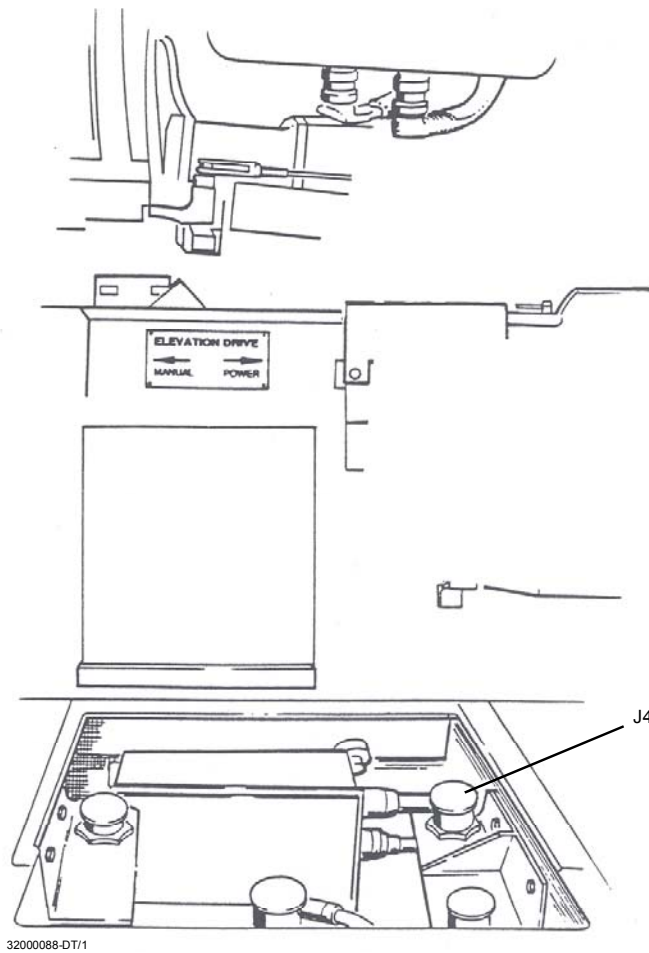ELEVATION DRIVE

MANUAL   POWER

J4

32000088-DT/1

Figure 2-47. M2/M3 Turret Diagnostic Test Panel Access.
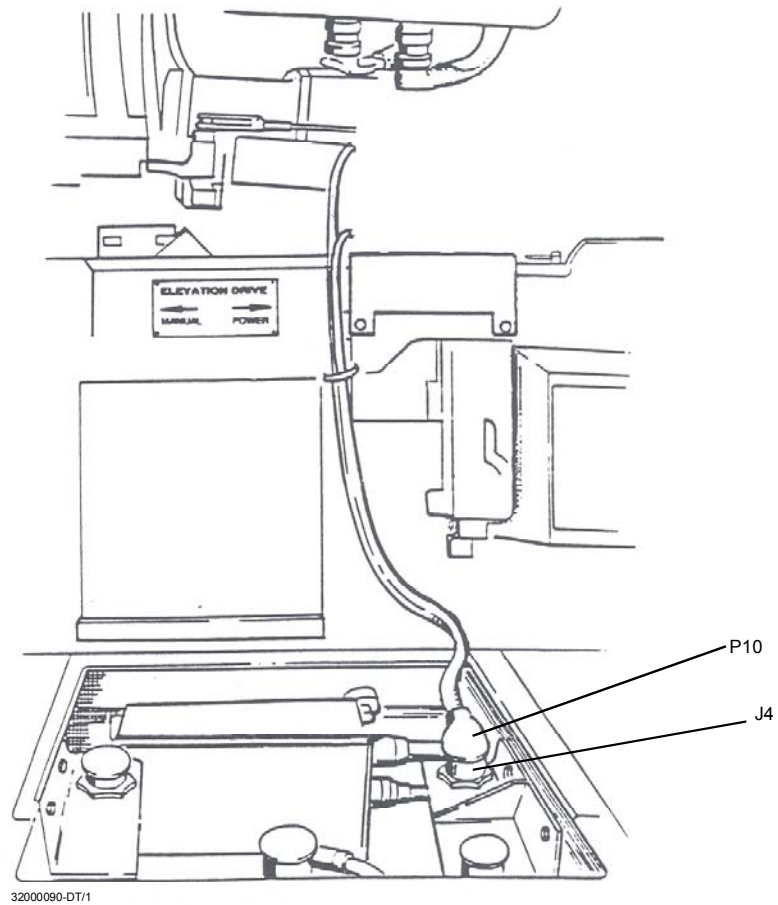
Figure 2-48. M2/M3 Turret Diagnostic Test Panel.
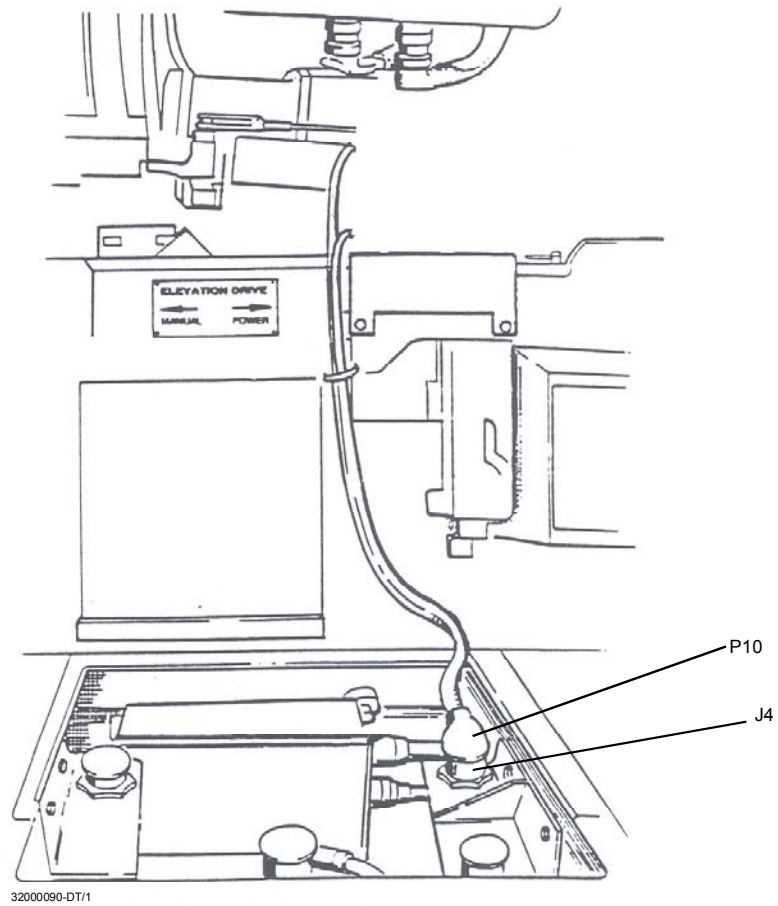
32000090-DT/1

Figure 2-49. M2/M3 P10 – J4 Connection.

2.3.2.13 <u>**Optical Turret Positioning Device (OTPD).**</u>

a. Remove the OTPD from the transit case and inspect for cracks in lens.

b. Replace and report damaged equipment as required.

c. Check to make sure a battery is installed in the OTPD. If there is no battery, or if the battery is bad, loosen the thumbscrew on the battery cover, open the cover, remove the bad battery (if there is one in place), and install a 9-volt battery. Secure the battery door by tightening the thumbscrew.

<u>**CAUTION**</u>

Ensure battery door is securely closed during storage and operations, or damage can occur to the battery door.

32000114-DT
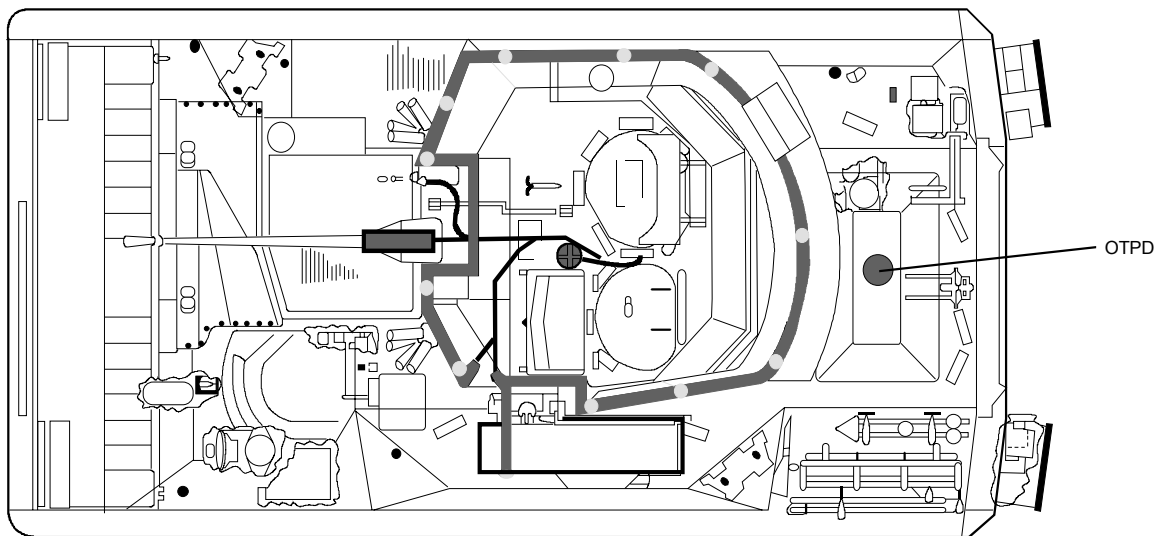
Figure 2-50. M2/M3 OTPD Installation.

d. Position the OTPD so the Infrared Transmitter Window points to the front of the vehicle and turret.

e. Power up the system and run BIT. If BIT fails, reposition OTPD and rerun BIT. When BIT passes, mark the position of the OTPD.

f. Apply fastener tape to the OTPD and to the center of TOW missile ammunition loading hatch. Refer to paragraph 2.3.2.1.2 for fastener tape preparation.

g. Attach the OTPD to the fastener tape on the weapons hatch and attach the lanyard. (See Figure 2-50.)

2.4 INITIAL ADJUSTMENTS, BEFORE USE, DAILY CHECKS, AND SELF-TEST REQUIREMENTS. Before operating MILES 2000 equipment, perform the following:

   a.   Ensure that Preventive Maintenance Checks and Services (PMCS) described in Section II have been performed.

   b.   If there is a DIFCUE installed on the vehicle, load the DIFCUE FU and arm the DIFCUE. (Refer to TD 9-6920-893-10.)

   c.   If there is an MGSS installed on the vehicle, load the MGSS FU and arm the MGSS. (Refer to TD 9-6920-892-10.)

   d.   Perform the functional checks described in Section V.

2.5 OPERATING PROCEDURES.

<div align="center">

NOTE

</div>

> Ensure that the Power Controller is fully charged. A Power Controller near discharge will cause either BIT to continuously cycle when the system is powered up, or cause the system to continuously reset. Should this occur, turn the Control Unit (CU) off, start the vehicle and allow the Power Controller to recharge for 15 minutes, or replace the Power Controller.

2.5.1 M2/M3 Control Mode on Operating Procedure. Upon power up, the Control Unit (CU) will come up with a vehicle status of "CHEAT KILL," and the KSI will flash continuously. The controller can reset the vehicle status by setting the CD/TDTD for "reset" and firing at a detector on the vehicle. The KSI will flash once and then stop flashing, and the vehicle intercom will sound with "reset." The vehicle may be made mission ready in one of two ways: 1) the controller can set up information for the vehicle and weapons type on the MARS computer and upload the information to the CD/TDTD, then upload the information to the vehicle via the optical port on the KSI; or 2) the controller can set the vehicle status to "Control Mode On," and the required information can be set from the CU.

<div align="center">

NOTE

</div>

> Pressing any other push buttons other than the following four (4) will shut Control Mode Off: Up Arrow, Down Arrow, CTRL/FCTN (red label), and the Enter (red label) push buttons.

Table 2-3. CVS Control Mode "ON."
This is an aid to help you make the proper vehicle selections for the system:

Host Platform	Vehicle Simulated	WESS Selection
M2/M3 Bradley	M2	Main Gun FlashWESS ATWESS No WESS COAX Blank Fire Dryfire Missile ATWESS Dryfire
M2/M3 Bradley	ZSU 23/4	Main Gun FlashWESS ATWESS No WESS COAX Blank Fire Dry Fire
M2/M3 Bradley	ZSU 23/4	Missile ATWESS Dryfire
M2/M3 Bradley	BMP II	Main Gun FlashWESS ATWESS No WESS COAX Blank Fire Dry Fire Missile ATWESS Dryfire

Table 2-3. CVS Control Mode "ON"-Continued.

Host Platform	Vehicle Simulated	WESS Selection
M2/M3 Bradley	BMP I	Main Gun FlashWESS ATWESS No WESS COAX Blank Fire Dry Fire Missile ATWESS Dryfire
M2/M3 Bradley	M3	Main Gun FlashWESS ATWESS No WESS COAX Blank Fire Dry Fire
M2/M3 Bradley	M3	Missile ATWESS Dryfire

Procedure

a. Turn the Control Unit (CU) on. MILES 2000 equipment should power up and automatically run BIT. Upon completion, the vehicle intercom sounds with "Audio Check" and indicates whether BIT passed or failed.

NOTE

During BIT, "Switch Test" will be displayed on the CU. Verify push buttons are working correctly.

b. After the power on BIT completes, the system will be in a "killed" state and will display "CHEAT KILL POWER SOURCE TAMPER" for approximately 7 seconds. The KSI will be flashing continuously. Using the CD/TDTD, reset the system.

c. Time Synch the system using a CD/TDTD. Aim at any detector and pull the trigger.

NOTE

Be sure that you use a CD/TDTD that has been Time Synched by another CD/TDTD. This ensures that all the exercise units and

d. Set the CD/TDTD to Clear Events and place the CD/TDTD into the Kill Status Indicator (KSI) optical port and pull the trigger.

e. Check the CU events and verify that it has been cleared.

NOTE

The Individual Weapons System (IWS) can be cleared in a similar fashion. Place the CD/TDTD into the Optical Port on the IWS Console (DPCU) and pull the trigger.

f.   Time Synch the system using a CD/TDTD. Aim at any detector and pull the trigger. (KSI will flash twice.)

g. Change the vehicle status to "Control Mode On" by setting the CD/TDTD accordingly, aiming at a detector, and pulling the trigger.

h. The KSI will flash once and the CU should display and the vehicle intercom will sound with:

CONTROL MODE ON
(LIMIT 5 MINUTES)

NOTE

The CU will indicate that it is in Control Mode On and that it will be in that mode for five (5) minutes.

i. With a vehicle status of "Control Mode On," perform the following actions:

(1) Press the BIT/CTRL/FCTN push button on the CU.

(2) The CU will display the main menu:

HOST PLATFORM
VEHICLE SIMULATED
WESS SELECTIONS (This applies only to vehicles with weapons, not SATs.)
RANGE MODE (This applies only to vehicles with missiles.)

(3) Move the cursor to "HOST PLATFORM" and press ENTER. The CU will display a list of vehicles.

(4) Move the cursor to your vehicle selection and press ENTER. The CU will return to the previous screen.

(5) Move the cursor to "VEHICLE SIMULATED" and press ENTER.

(6) The CU will display:

DEFAULT VEHICLES
CUSTOM VEHICLES

(7)   Move the cursor to "DEFAULT VEHICLE" and press ENTER. The CU will
        display a list of vehicles.

(8)   Move the cursor to your vehicle selection and press ENTER. The CU will display
        the Ammo & Rate Control screen.

(9)   The CU will display:

        KEYBOARD SELECTED
        VEHICLE SELECTED

(10)   Move the cursor to "VEHICLE SELECTED" and press ENTER. The CU will
        display the Threshold screen.

(11)   The CU will display a default threshold of 75 for the M2/M3. Press ENTER.

NOTE

Should the vehicle be assessed a Cheat Kill, after a Mobility Kill, due to
crew movement, turret movement, engine vibration, etc., ask the Controller
to increase the vehicle's threshold level.

(12)   The CU will return to the main menu. Move the cursor to "WESS
        SELECTIONS."

(13)   The CU will display the "WESS SELECTIONS" screen.

(14)   With the cursor on WESS SELECTIONS, press ENTER. Refer to Table 2-3 for
        WESS Selection options. The CU will display the weapons for the vehicle you
        have selected.

(15)   The CU will return to the main menu. Moved the cursor to RANGE MODE.

(16)   The CU will display the "RANGE MODE" screen.

(17)   Move the cursor to "Enter" flight time and press ENTER.

(18)   Select 15 seconds if only MILES 2000 vehicles will be engaged, or 9 seconds if
        Basic MILES vehicles will be engaged, for time of flight, using the Arrow push
        buttons to adjust the time, and press ENTER.

(19)   This returns you to the main menu.

(20)   Press the WEAPON SELECT push button on the CU. The CU will read "Control
        Mode Off," the KSI will flash once, and the vehicle intercom will sound with
        "Control Mode Off."

2.5.2 MILES 2000 M2/M3 Boresight Procedures. A modified list of the boresighting procedures can be found in Appendices A.

a. Install the MILES 2000 equipment on the M2/M3.

b. After the Universal Laser Transmitter (ULT) is securely mounted on the main gun, remove theadjustment cover from the back of the ULT. Sight through the ULT scope and using the adjustment knobs, move the transmitter cross hair so that it is centered down the main gun bore.

NOTE

Refer to the appropriate manual and perform main gun boresight procedures prior to boresighting the MILES 2000 Universal Laser Transmitter (ULT).

c. Have the gunner look through the ULT scope and talk the gunner onto a defined aiming point at maximum effective engagement range or at a maximum range of 3000 meters.
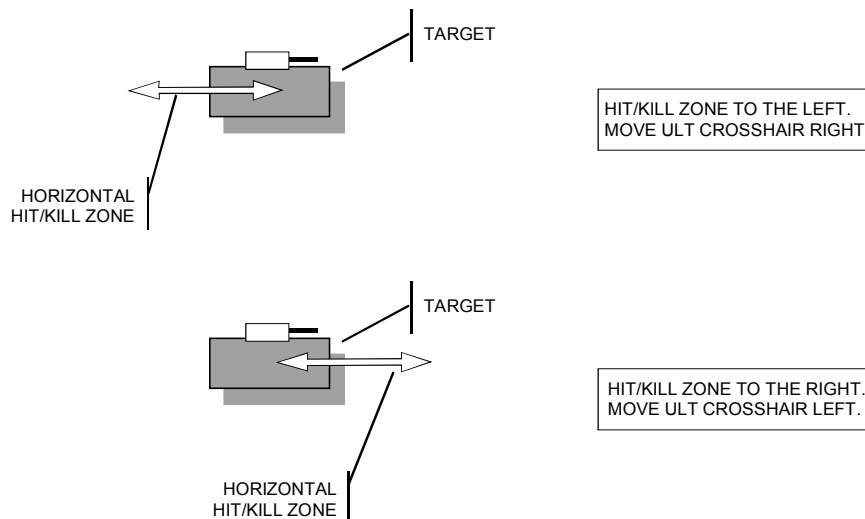
NOTE

The maximum effective engagement range is a gunnery term which could mean 3000 meters for a desert operation or 1000 meters for a CTC operation depending on the terrain and planned operational situation.

d. Remove the adjustment cover from the back of the ULT. Sight through the ULT scope and using the adjustment knobs move the transmitter reticle to lay on the same defined aiming point at the AP reticle.

e. Place a MILES 2000 equipped target at a range between 1500 and 3000 meters. If these ranges are not available, place the target as far away as possible. The closer to 3000 meters, the more accurate the alignment.

f. Select AP single shot and use the hand wheels to lay the gunner's daysight reticle circle onto the center of mass of the MILES 2000 target. Fire one (1) round. A Hit, Kill or Near Miss should be registered at the target.

g. Use the hand-wheels to move the aim-point up (use small increments). Fire a round at each new aim-point. You want to find the highest aim-point at which a Kill or Hit is registered on the target. Depending on the range and the target, the highest aim-point may be above the target. **Mentally note where this aim-point is**.

h. Use the hand-wheels to move the aim-point to the center of mass of the target.

i. Use the hand-wheels to move the aim-point down. Fire a round at each new aim-point. You want to find the lowest aim-point at which a Kill or Hit is registered on the target. Depending on the range and the target, the lowest aim-point may be below the target. **Mentally note where this aim-point is**.

j. Use the hand-wheels to move the aim-point to the center of the Hit/Kill zone. Use the Gun Boresight EL adjustment knob, without moving the hand-wheels or ULT, to center the reticle circle on the center of mass of the target. Fire one (1) round and verify that a Kill or Hit is registered on the target.

NOTE

The center of the Hit/Kill zone is midway between the highest and lowest aim-points that got a Kill or Hit.

k. Use the hand-wheels to move the aim-point right (use small increments). Fire a round at each new aim-point. You want to find the aim-point farthest to the right at which a Kill or Hit is registered on the target. Depending on the range and the target, this aim-point may be to the right of the target. **Mentally note where this aim-point is**.

l. Use the hand-wheels to move the aim-point to the center of mass of the target.

m.   Use the hand-wheels to move the aim-point left. Fire a round at each new aim-point. You want to find the farthest aim-point to the left at which a Kill or Hit is registered on the target. Depending on the range and the target, this aim-point may be to the left of the target. **Mentally note where this aim-point is.**

n. If the farthest right and left Hit/Kill aim-points are approximately the same distance from the center of the target (horizontal kill zone centered on target), then no adjustment is needed (**GO TO STEP p.**). If the aim-points are not equal distance from the center of the target, then adjust the ULT by moving its bottom adjustment knob. (See Figure 2-51.) Move the ULT cross-hair in small increments. DO NOT move the turret hand-wheels or the Gun Boresight knobs.

Figure 2-51. M2/M3 Horizontal Hit/Kill Zone.

o. Go back to step l. and recheck the Hit/Kill zones.

NOTE

Perform standard TOW alignment procedures.

p. Select TOW on the Missile Control Box. Without moving the Power Control Handles, use a small flat tip screw driver to turn the TOW boresight screw to lay the TOW reticle on the center of mass of the target.

NOTE

To change to Dry Fire Mode, refer to subparagraph 2.5.1 M2/M3, Control Mode On Operating Procedure, under WESS SELECTION (step i). Use Table 2-3 to select the Dry Fire Mode.

q. Load and fire a TOW missile at the target. A Hit or Kill should be registered.

CAUTION

Use local safe/proper handling procedures when removing undetonated ATWESS cartridges. Notify Explosive Ordinance Disposal (EOD) for a pick up as required.
TOW cartridges may expel fragments/debris. Maintain prescribed actual weapon danger/caution zones when using the TOW.

r. Select AP HI. Using the Power Control Handles, do a "G" pattern and lay the AP reticle on the center of mass. Fire one round at the target. A Hit or Kill should be registered.

s. Replace the adjustment cover on the ULT.

2.5.3 Console Display at Night or Limited Visibility.

a. Press either of the Arrow push buttons on the CU (or IWS Console (DPCU)). This will light the display for three (3) seconds.

b. Make your selection. Once a push button is pressed, the display will stay lighted for 7.5 seconds (or for 7.5 seconds after the last push button has been pressed).

c. After the last push button is pressed, and 7.5 seconds has elapsed, the display will return to the default screen. The display will then stay lit for another three (3) seconds.

d. When a BIT is run [from power-on (battery replacement) or initiated by the user] the display will stay lit during BIT.

2.5.4 MILES 2000 M2/M3 Loading Procedures.

NOTE

The Coax Machine gun may be fired at any time. You do not have to select it to fire it. Fire weapon using normal procedures.

a. Press the Weapon Select push button on the CU and press Enter.

b. Move the cursor to "Main 1(Feeder 1)," "Main 2(Feeder 2)," or "Missile" and press Enter.

c.   Press the Ammo Select push button.

d.   The CU should display:

> **APDS   350**
> **HEAT   1150**

NOTE

When using an M2/M3 System, ammo selection must be made on both the CU and Vehicle Ammo Selection switch, and the selection must match. If the ammo selection **DOES NOT** match, the user will get a "Near Miss" when firing at a target.

e.   Move the cursor to your ammo selection and press Enter.

f.   Press the Reload push button.

g.   The CU may display (depending on what you have selected/loaded):

> **Main 1   APDS**
> **00050   Rounds**

NOTE

The maximum number of rounds that may be loaded at any one time are 200 AP or 300 HE, loaded in 50 round increments. The maximum number of rounds available are 350 AP and 1150 HE.

h.   To load the other feeder ("Main 2"), use the above procedure.

i.   To load the missile, press the Weapon Select push button on the CU and press Enter.

j.   Move the cursor to Missile and press Enter.

k.   Fire the main gun or the TOW.

NOTE

When firing the main gun/TOW the CU will display one of the following:

> **HEAT   SS, LO, or HI**
> **APDS   SS, LO, or HI**
> **Missile**

Where SS=single shot, LO=100 rounds/minute, and HI=200 rounds/minute.

SECTION IV. OPERATION UNDER UNUSUAL CONDITIONS

2.6 ASSEMBLY AND PREPARATION FOR USE UNDER UNUSUAL CONDITIONS.

2.6.1 Unusual Environment/Weather. MILES 2000 equipment is ruggedized to withstand extreme changes in temperature, terrain, and environment. Therefore, assembly and preparation in unusual environment/weather should only require the caution necessary to ensure the safety of the operators and other participants.

2.6.2 Fording and Swimming. MILES 2000 equipment is waterproof and ruggedized. Therefore, equipment transport which requires fording and/or swimming should only require caution necessary to safeguard operators and participants, and to maintain control and accountability of the equipment.

2.6.3 Emergency Procedures. MILES 2000 equipment requires no additional procedures for emergency situations, as the equipment has been developed to be used for training simulations encompassing a great variety of conditions and levels of threat.

SECTION V. FUNCTIONAL CHECKS

2.7   FUNCTIONAL TEST PROCEDURES.

The functional check for MILES 2000 M2/M3 equipment is accomplished by the Built-In-Test (BIT) performed by the Control Unit (CU). It will run the BIT, and the CU display screen will stay lighted during the test. Once the test has been run, the CU will display the results on the screen. Table 3-1 in Chapter 3, Section I, Troubleshooting, contains the list of possible error messages the CU may display with MILES 2000 equipment.

2.7.1 Built-In-Test (BIT). To run the vehicle system BIT, perform the steps in Table 2-4. To run the ATWESS BIT, perform the steps in Table 2-5. To run the Individual Weapons System (IWS) BIT, perform the steps in Table 2-6.

Table 2-4. Vehicle System Built-In-Test.

ACTION	INDICATION
Turn Control Unit (CU) on.	CU display should light and stay lighted throughout the test.
	MILES 2000 equipment should power up.
	Vehicle intercom sounds with "Audio Check," then indicates BIT pass or failure. The KSI will flash continually.
	CU will automatically begin the BIT.
"SWITCH TEST" will be displayed on the CU and LU.	User may now test push buttons on CU to ensure the push buttons are working properly.
Press the "WEAPON SELECT" push button on the CU and LU.	The display should read "WEAPON SELECT."
Press the "AMMO SELECT" push button.	The display should read "AMMO SELECT."
Continue to do the switch test until you are satisfied that the push buttons are working properly.	The display should match the label of the push button being pressed. Arrow push buttons should read "UP" or "DOWN."
To continue the BIT, simply stop pressing push buttons.	The unit will automatically continue the BIT without further command.
Read results of BIT.	The display will indicate the following:
	"CHEAT KILL POWER SOURCE TAMPER"
Reset vehicle with CD/TDTD	The display will indicate one of the following:
	READY - The equipment has passed the BIT and the mission may be continued. or **BIT PASSED -** Indicates an operational system. or **BIT FAIL (with error message)** - All or part of the equipment has failed the BIT, or the equipment is not present or is not properly connected. Refer to Chapter 3, Section I, Table 3-1 for further action. or **KILLED** - The equipment has suffered a Catastrophic Kill. Contact the Controller.

Table 2-5. ATWESS Built-In-Test.

Problem	ACTION	Result	Next Step
ATWESS does not fire .	Make sure simulation tube is properly seated; retest.	ATWESS fires.	Continue the mission.
		ATWESS does not fire.	Remove and replace the simulation tube.
	Retest.	ATWESS fires.	Continue the mission.

Table 2-6. IWS Built-In-Test (BIT).

ACTION	INDICATION
For PN 147421, insert battery in Individual Weapons System (IWS) Console (DPCU). This will automatically power up the console.	IWS Console (DPCU) will automatically run the BIT. IWS Console (DPCU) display should light and stay lighted throughout the BIT.
For PN 148245, move (gently shake) the IWS Console (DPCU). This will activate the internal mercury switch and automatically power up the IWS Console (DPCU).	IWS Console (DPCU) will automatically run the BIT. IWS Console (DPCU) display should light and stay lighted throughout the BIT.
"SWITCH TEST" will be displayed.	User may now test push buttons on IWS Console (DPCU) to ensure the push buttons are working properly.
Press the "WEAPON ON/OFF" push button.	The display should read "WEAPON ON/OFF."
Press the "EVENTS" push button.	The display should read "EVENTS."
Continue to do the switch test until you are satisfied the IWS Console (DPCU) push buttons are working properly.	The display should match the label of the push button being pressed. Arrow push buttons should read "UP" or "DOWN."
BIT continues after switch test.	
BIT results.	"PASS" indicates IWS is operational.
	"FAIL" indicates a problem.
	Refer to Chapter 3, Section I, Table 3-1.